Technical Report 819

Longitudinal Research Into Methods of Assessing Managerial Potential

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U.S. Army
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This report describes research on the prediction of executive potential. An assessment technique, the Career Path Appreciation (CPA), was developed based on the logic of Jaques' Stratified Systems Theory. Lower and middle level managers were assessed and followed up over periods ranging from 4 to 13 years. Predictive validities ranged from 0.7 to 0.9, strongly suggesting that (a) development beyond the lower and middle levels of organization is heavily dependent on conceptual ability, and (b) individual development beyond lower and middle levels should focus strongly on enhancing conceptual skills, as opposed to knowledge-based instruction. These results strongly support the logic of Stratified Systems Theory.

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FOREWORD

The U.S. Army Research Institute for the Behavioral and Social Sciences (ARI) is actively pursuing a research program to identify executive-level leadership and decision skills and to develop methodologies for assessing and developing these skills. This program is largely based on the Stratified Systems Theory of Elliott Jaques.

The present report contains findings based on long-term follow-up of a variety of lower and middle level managers who were assessed using a technique that purportedly measures conceptual ability. The managers were drawn from a number of different companies and settings, and the period of follow-up ranged from as little as 6 years to as many as 14. The remarkably high predictive validities obtained in this research are convincingly supportive of SST and further support the contention that the potential for development beyond the lower and middle levels of organization rests largely on conceptual ability.

This research effort was monitored by ARI's Executive Development Research Group under Program Task 4.5.5, Executive Doctrine Development, under authority of a Letter of Instruction from DCSPER, DA, dated 17 June 1985. Dr. Herbert Barber, U.S. Army War College Department of Command, Leadership, and Management, has been briefed on this work and on possible applications, which include developmental assessment for War College students to aid their subsequent growth.

EDGAR M. JOHNSON
Technical Director

LONGITUDINAL RESEARCH INTO METHODS OF ASSESSING MANAGERIAL POTENTIAL

EXECUTIVE SUMMARY

Requirement:

To develop a procedure to predict rate of growth of individual capability to handle increasing responsibility (managerial potential) and to test a theory of organization structure and adult development.

Procedure:

Predictions of potential were made for 182 men and women of Anglo-Saxon and African origins working at all levels in two multinational and two national organizations. No information about predictions was given to the individuals or to their managers. Follow-up studies were conducted over periods ranging from 4 to 13 years. The studies gathered data from company records about the level of responsibility at which the individual was employed and correlated these data with the level that would have been predicted. Predictions were also made for 92 people employed by an organization in a developing country. Sixty-three percent of this group are Africans and 51% have not been educated beyond primary school level. For this group, evaluations of potential were used to predict individual "comfort curves," the rate of growth of responsibility that is in line with the predicted rate of growth of capability.

Findings:

For the whole sample, the correlation coefficient between the predicted rate of growth of capability and level of responsibility was .79.

By 1979, the procedure for predicting potential had been refined into a guided interview called a Career Path Appreciation (CPA). The correlation coefficients for follow-up of CPA are .89. This figure may be compared with two other longitudinal studies of potential: one in the USA and one in the UK, where the correlations were .44 and .66, respectively.

Follow-up on the individuals for whom "comfort curves" were predicted has shown that, over periods ranging from 2 to 5 years, the shape of the curve predicted has been borne out in 94% of the cases.

CPA is an accurate predictor of rate of growth of capability to handle increasing responsibility. It requires highly trained and experienced administrators but, since the interview lasts for only 2 or 3 hours, it is cost effective.

CPA offers the individual the opportunity to review his or her working life and the organization the opportunity to review the effectiveness of its human resources and the appropriate rates for their development.

The accuracy of the predictions made by CPA provide further confirmation of the Stratified Systems Theory of organization structure and adult development.

Utilization of Findings:

The remarkably high predictive validities found in this research strongly suggest that (a) development beyond the lower and middle levels of organization is heavily dependent on conceptual ability, and (b) individual development beyond lower and middle levels should focus strongly on enhancing conceptual skills, as opposed to knowledge-based instruction. These conclusions have strong implications for pedagogical approaches in the Senior Service Colleges, and for leader development in general. They are supportive of current directions in the Army War College. The developmental assessment will be tried at the Army War College on an experimental basis with a small group of students during the next academic year.

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Introduction

The primary purpose of this paper is to present long-term fcllow-up of predictions of individual differences in the potential to carry responsibility for work at different levels of complexity within organisations. The significance of predicting potential -- especially in a rapidly changing world -- can be simply stated: People represent a significant short- and long-term investment for the organisation of which they are a part. Accurate evaluation of the rate of appreciation of that investment ensures effectiveness of the organisation, considerable financial savings and, not least, dignity for the individuals concerned. For example, if an organisation is likely to be called upon to meet new challenges, an accurate picture of the current state of the potential of its human resources and of the rate at which they are likely to grow is essential if the challenges are to be met.

Section 1: Predicting Potential

a. Meta-analyses

1. In the last twenty years there has been a very substantial number of studies of potential. One of the best known is Bray's work with AT&T (Bray and Grant, 1966, Bray, Campbell and Grant, 1974). Two recent articles provide meta-analyses of the results of many investigations of these studies (Schmitt, Gooding, Noe and Kirsch, 1984; Hunter and Hunter, 1984). The implications of these studies for practice in the U.K. are examined by Herriot (1987).

In broad terms the meta-analyses are concerned with the relationship between procedures for predicting potential and criteria for evaluating success. The procedures which are most widely covered in the analysed literature are tests of cognitive ability, work samples, (of which job knowledge may be a sub-set), assessment centres, biographical data, personality tests, interviews and references. The most commonly used criteria are training success and job proficiency -- the latter evaluated by ratings or rate of promotion and measured by productivity or salary.

A quick overview of the validity coefficients of five of the studies of procedures for predicting potential covered in these papers is summarized in Table 1.

Table 1

Summary of Five Studies of Validity Coefficients of Procedures for Predicting Potential

Predictors	Herriot (1987)	Dunnette (1972)	Reilly & Chao (1982)	Hunter & Hunter (1984)	Schmitt (1984)
Cognitive ability	.27	.55[a] .45[b]	-	.53	.248
Work sample	.38	-	-	.44	.378
Job knowledge	-	.51	-	.78[c]	-
Biographical data	.24	.34	.38	.37	.243
Assessment centres	.41	-	-	.63[d] .33[e]	.407
Personality tests	.15	-	-	-	.149
Interviews	.14	-	.23	.14	-
References	-	-	.17	.26	-

a. Training success.

b. Job proficiency.

c. Trained subjects.

d. With promotion.

e. With job proficiency.

b. Comment on Procedures for Predicting Potential

It will be clear from Table 1 that assessment centres offer predictions with the highest validity; but Hunter and Hunter (referring to Cohen, et al., 1974) point out that the correlation of .63 is with promotion. There is a much lower correlation (.33) with actual performance. The findings on tests of cognitive ability as a predictor are also not clear cut; Schmitt (1984) suggests that the lower validity in his studies may be accounted for by the fact that Hunter and Hunter had access to extensive unpublished materials. It is also of interest that tests of cognitive ability offer a correlation of .55 with training success yet only .45 with job proficiency.

The relatively high validity of biodata as a procedure prompts Hunter and Hunter to comment that its accurate use requires a large sample. They refer to one consortium where a Supervisory Profile Record (SPR) has been developed from a data base with input from thirty-nine organisations. The validity of the S.P.R. for predicting supervisory ratings is .40, with no variation over time and little across organisations (Hunter and Schmidt, 1975, pp 1067-1068).

As far as job knowledge is concerned, Hunter and Hunter (1984) point out that, despite their high validity, the use of job knowledge tests is limited by the fact that they can only be used for prediction if the employees (or subjects) have already been trained for the job.

Schmitt (1984) and Asher and Sciarrino (1974) draw attention to the relationship between the procedures for predicting potential and the criteria used for evaluating success. Schmitt (1984) refers to the general concern that criteria should be as objective as possible; but points out that, in the studies that he and his colleagues analyzed, criteria tended to fall into two broad categories -- training success and job proficiency. As outlined above, the latter may be rated by immediate supervisors or measured by output, sales, salary, or rate of promotion.

c. The Relationship between Procedures for Predicting Potential and Criteria

In considering the relationship between procedures and criteria, Schmitt (1984) follows Wernimont and Campbell's (1968) suggestion that development of procedures intended to be actual job samples should result in increased validity coefficients. Behavioural consistency theory suggests that the closer one can come to getting some measure or indication of performance on samples of work activities that people might be expected to perform in a job, the better predictions one would be able to make of the actual performance of individuals on the activities in question.

More technically, if predictor and criterion measures fall within the same content domain, the validity of correlations should be maximized. Schmitt et al. (1984) implies that the question of content domain

underlies the validity of work samples or job try-out as good procedures for predicting job proficiency (see Schmitt et al., 1984, p 417 for a summary table of average validity coefficients for predictor-criterion combinations; see also Bray, et al., 1966).

The importance of procedures for predicting potential and criteria of success being within the same content domain is underlined by Anstey in his paper on the thirty year follow-up of the Civil Service Selection Board (CSSB) procedure in the United Kingdom (Anstey, 1977). In describing the procedure, Anstey makes it clear that the original CSSB techniques were based on careful analysis and modelling of the work of senior administrators. There is a suggestion that that is one of the reasons why the Civil Service obtained probably the highest ever validity coefficients for high grade selection in any country.

One of the overall conclusions that can be drawn from these summaries of studies of predicting potential is that the most effective procedures for predicting job proficiency at some future date are those which sample the work which is actually going to be undertaken either in the immediate or the longer-term future. This conclusion points to the importance of the content validity of the tests or situations designed to elicit the behaviours used as indications of potential.

It is, however, not possible to devise effective work-sampling procedures until there has been a thorough analysis of the work to be done. Hunter and Hunter (1984) suggest that the validity of work sampling as a procedure could be enhanced if it were integrated with other procedures with a reasonably high validity (tests of cognitive ability and biodata) (see Hunter and Hunter, 1984 re. alternative predictors and Anstey, 1977 re. integrating rather than adding).

d. The Contribution of Theory

Behind content validity, there is the question of construct validity -- the theoretical underpinning of the procedures for predicting potential, the criteria for evaluating success and the relationship between them (see, for example, Stewart and Stewart, 1977 and Guion, 1987). At minimum, construct validity would (a) enhance content validity by providing a definition of work which, by explicating the nature of the predictor, would make it possible to design more effective procedures for prediction; (b) bring predictors and criteria into a common content domain and (c) provide an explicit statement about adult development and individual differences.

The meta-analyses tend to suggest that, apart from the concept of cognitive ability, the predictors underlying the procedures are largely implicit and not clearly defined. It is the procedures for predicting potential rather than the predictors which are offered as hypotheses for testing.

A common assumption in assessment and prediction is that adults do develop; and, further, that they develop at different rates. In some assessment settings these assumptions are made manifest in the form of

a Minimum Development Curve based on organizational structure and time constraints. For example, in the United Kingdom Civil Service, a graduate administrative entrant with a mark of 3 is predicted to be able to work as a Principal within five years of entering the service. This prediction in time is relative to entrance and does not refer to the age of the candidate.

In the absence of an explicit hypothesis about adult development and differences in rate of growth, assessment procedures are designed on the basis of statistical models. Tests and techniques are retained if the correlations are good enough and there is little impetus for review.

The requirements for construct validity are met by Stratified Systems Theory which provides the base for the development of the procedure for predicting potential described in this paper.

Section 2: Stratified Systems Theory

a. Definition of Work

Stratified Systems Theory (SST) (see Jaques, 1975, 1982 and Evans, 1979) provides a definition of work -- "The effort to accomplish a goal requiring the exercise of discretion within prescribed limits and within a stated completion-time". The theory postulates that the core of the psychological experience of doing work is "the exercise of discretion".

The prescribed limits are the rules of the organisation in the form of policies, procedures, physical controls, signals and other types of control which are objectively set. In short, these controls may be taken as an indication of the things that must be done. They state the boundaries of the work and define the scope of the discretionary environment.

By contrast with the things that must be done, the exercise of discretion is concerned with the choices that must be made. The word "discretion" comes from the past participle of the verb "to discern", i.e., to distinguish, to separate apart. The word "discretion" was chosen to convey the psychological process of mulling over a number of courses of possible action which could be used to reach a goal, reaching into the self to choose those (or the one) which are/is most likely to reach the goal; then acting on that choice. In other words, the exercise of discretion may be thought of as the imagination, formulation and execution of a course of action which is not prescribed. One of the characteristics of discretion is that, to the extent that the person is capable of making the choices that must be made, s/he will not perceive that discretion is being exercised.

b. Levels of Work

In addition to the core definition, the theory provides a model of how work is structured in levels of increasing complexity within the organization in order to take account of the complexity of the environment (see Table 2). It follows that the scope of discretion must increase at higher levels because the increasing complexity prohibits the formulation of precedent, procedures and rules.

This complexity can be measured by considering the shortest time period that can elapse in order to obtain feedback about choices made. This is the minimum time that must elapse before it is clear that the choices made about courses of action have not been adequate to the complexity of the environment. The consequences of grossly inappropriate choices will become apparent fairly quickly, but it may be months or even years before the consequences of marginally inappropriate choices become manifest. From this perspective it is possible to rephrase the definition of work given above and to redefine work as "effort to realise purpose in practice and to review practice in the light of purpose".

Table 2

Levels of Work in Civilian and Military Organizations

Level of Work	Time-span		Description	Civilian Organization	Military Organization
	50 yrs.				
VII		strategic	Strategic design, development, deployment of complex systems.	Corporation	MACOM Army Board
	20 yrs.				
VI			Direct deployment of complex systems.	Group	Corps
	10 yrs.				
V		comprehensive	Complex systems, encompassing operating systems and modifying context	Subsidiary	Division
	5 yrs.				
IV			Alternative operating systems -- general management	General Management	Brigade
	2 yrs.				
III		operational	Direct operating systems -- management of a mutual recognition unit	Unit	Battalion
	1 yr.				
II			Direct operating methods -- supervision of a mutual knowledge system	Section	Company
	3 mths				
I			Direct operating tasks	Shop Floor	Squad

Because the measurement of level of work refers to the time scale of review of the exercise of marginally substandard discretion, the measurement tool is called "the time-span of discretion".

c. The Array of Growth Curves

The theory also includes a description of how work is experienced by the person engaged in it -- of how the exercise of discretion actually feels -- and an explicit hypothesis about rates of growth of the individual capacity to exercise discretion; and, therefore, to do work at levels of increasing complexity.

This hypothesis is presented in the form of an array of growth curves which follow the sigmoidal progression characteristic of biological growth. The array was derived originally from studies of individual earning progressions of five hundred and twenty people and subsequently tested with a further three thousand cases (see Jaques, 1968). Jaques (op. cit.) then constructed the hypothesis that the regularity he had charted in individual earning progressions reflected growth in the person's capacity to cope with work of increasing complexity. The array of curves thus represents statistical facts about pay and an hypothesis about regularity in rate of growth over time of the capacity to exercise discretion.

The relationship between the levels of work of increasing complexity and the array of growth curves is illustrated in Figure 1 where the growth curves are grouped into modes, each mode including all curves which reach a maximum point of development in the same level of work.

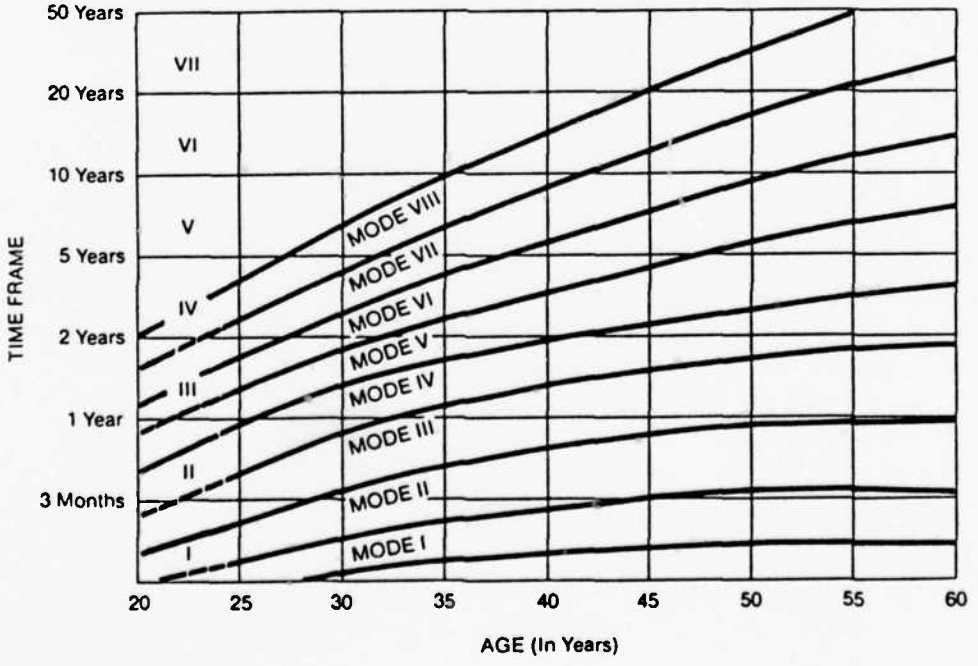


Figure 1

Levels of Work and the Array of Growth Curves

By providing a definition of work, SST (a) enhances content validity and allows effective work-sampling; and (b) brings predictors and criteria into a common content domain. By offering an explicit hypothesis about rates of growth of the capacity in adults to exercise discretion, (and, therefore, to do work) the theory establishes a relationship over time between specific predictors and particular criteria. For example, the theory makes it possible to predict how long it will be before a particular person is likely to be capable of exercising discretion and doing work at a particular level. Finally, the theory offers the hypothesis that growth in "the capacity to exercise discretion" is expressed in "the capacity to cope with complexity".

Section 3: The Procedure for Predicting Potential and the Criterion

The studies of prediction of potential were undertaken in four very different settings which will be described in detail in Section 4. Briefly they are a multinational oil company, a multinational engineering company, a national fertilizer company and a British-owned multinational mining company operating in a developing country.

a. Development of the Procedure

In each setting the procedure used was an evaluation of the current scope of the person's capacity to exercise discretion or cope with complexity -- in other words, his or her "current level of capability," defined as "the person's capability at a particular age to generate and to respond to complexity within the world, within him/herself and in the constant work needed to keep both in equilibrium".

In the early stages of the research, the evaluation of current level of capability was made by means of an extended interview which was based in the definitions and models of Stratified Systems Theory. By 1979 the interview had been developed into a procedure called "Career Path Appreciation".

Starting from the idea that, from a psychological perspective, work is discretion realized in action, we decided to design a procedure which would allow us to observe the person at work. The definition of work provided the basis for the content validity of the procedure which may be thought of as work sampling -- not in the concrete sense, but in the sense of observing how discretion is being exercised -- or, in other words, how the person is coping with complexity. The handling of complexity is a generic component of work at all levels. The predictor is, therefore, tapping a universal component which is hypothesized to be highly related to advancement.

Because we wanted to set up a microcosm of the psychological experience of doing work, we decided not to use general tests of ability. These are good predictors of crystallized intelligence and achievement in education and training settings. But we felt that they were less likely to predict the fluid intelligence which we assumed to be closer to the idea of realizing discretion in action. We also thought that general tests of ability were more likely to reflect "static" individual differences rather than the growth in individual capability which we sought to predict.

In parallel with Jaques' early work on the exercise of discretion, Isaac and O'Connor (1969, 1973) had been engaged in experimental, statistical studies of judgment in action. Building on their work (Isaac and O'Connor, op. cit.) we decided to start by using a task which came originally from the concept formation literature (see Bruner, 1966). Because we were not trying to measure the ability to learn, but to observe judgment or discretion in action, we decided to give only minimal instructions to the respondent and not to offer rehearsal.

The task required the respondent to discover and implement a predetermined sorting rule. Cards carrying a symbol or combination of symbols which vary in colour, number, size and shape, were provided. In the pack overall there are three colours, three numbers, three sizes, and three shapes. At the beginning of the task four display cards were set out. Three of these illustrated various combinations of the four factors, and the fourth was blank. The respondent was given a pack of 162 cards, each carrying a different combination of the four factors.

The respondent was asked to place each card below the display cards in such a way that they corresponded with a pre-set order. The goal was to place ten consecutive cards correctly, but there were no restrictions on time or number of cards. To enable solution, the administrator gave the following information: In the case of the three cards displaying symbols, the respondent was told whether or not the placement was correct. In the case of the blank card, no feedback was given.

At the end of this task the administrator initiated a very brief discussion with the respondents about their current work, the history of their careers and their aspirations for the future.

With this procedure it appeared to be possible to elicit enough information about the respondents' characteristic patterns of realizing discretion in action to evaluate each person's level of capability -- thus, the level of work at which s/he would currently be effective. In the very early stages of the work this evaluation was checked against the level of work at which the respondent was actually employed. Although no formal correlations were made, the degree of correspondence was deemed satisfactory.

If the evaluation of current level of capability at a particular age is set against the array of growth curves (see Figure 1), it includes a prediction about the likely current level of capability at any given time in the future. At this stage of the development of Career Path Appreciation, the predictor (the evaluation of current level of capability) was made on the basis of information elicited in this way.

In the course of analyzing the interview protocols and, in particular, comments elicited by respondents about the way they had constructed and tested strategies, it became clear that a further important source of information about characteristic patterns of realizing discretion in action lay in these comments.

Out of more than a hundred phrases taken from protocols of the symbol card task, 54 were chosen for a final pack of phrase cards. They were chosen because, in the course of testing the hundred, these emerged as the phrases which were most open in the sense that they could be given a wide range of interpretations according to the understanding of the respondent. As a consequence, these were the phrases which consistently elicited the fullest discussions about the way that each respondent approached his or her work. The 54 were arranged in nine sets of six and added to the extended interview by giving them to the respondent before the symbol card task.

The enhanced understanding of the respondent's patterns of realizing discretion afforded by these phrase cards, and the evident reflective enjoyment and insight they gave, warranted their inclusion in the procedure. There is no attempt to score respondents' comments about the cards; comments are analysed for content in the light of the model of levels of capability (see Table 3).

During the same period it became clear that more information would be available to the administrator (and to the respondent) if the career interview was more structured. We therefore decided to ask the respondent to talk about times when s/he felt that there had been a good correspondence between their own capacity to exercise discretion and the work for which they were responsible, times when they felt they had been overstretched and times when they felt they had been underused.

Once the phrase cards and the more detailed work history had been tested and added to the extended interview, it became clear that what had been developed was a procedure which makes it possible for the respondents to put their characteristic strategies and feelings about work into words for the first time. An almost universal response to an Appreciation is the comment "I have never thought about my work like this before". At this point the procedure was named Career Path Appreciation.

At the beginning of the Appreciation the respondent is offered each set of phrase cards separately and asked to choose the card which s/he feels reflects most closely the way s/he would approach a piece of work. Respondents frequently comment on more than one card, or may choose to put the cards in some order or to put aside those which they feel do not relate in any way to their own approach to work. The Appreciation then moves on to the symbol card task, the work history and a discussion about the respondent's aspirations for the future of his or her working life.

The symbol card task and the phrase cards are both open to the strategies and interpretations the respondent wishes to place on them. For example, respondents will frequently say "I take it that this card means ....". It is not usually necessary for the administrator to reply; but, if it is, an indication will be given that the respondent is free to give his/her own meaning to the phrases. Further, the <u>tone</u> of the Appreciation is such that the respondent is encouraged to bring to bear rational, analytic <u>competence</u> and the mulling and separating apart which is the core of the exercise of discretion.

Career Path Appreciation is a procedure that allows a particular kind of work-sampling. The nature of the procedure is such that it creates a shared setting in which the respondent can play out the characteristic ways in which s/he works. In this setting internal resources on which respondents have been drawing to do their work become part of the shared experience of each respondent and administrator. In becoming spontaneously aware of these resources, the respondents increase their skill for tapping them in the future. The administrator can also draw the attention of the respondent to these internal resources so that they may be further explicated.

Table 3

The Eight Levels of Capability

VIII	Transforming: the international and/or national context and create alternative social institutions.
VII	Extrapolation: from contexts at stratum VI and create connections which can sustain the formation and development of stratum V institutions initiated at stratum VIII.
VI	Defining: generate a range of perceptions of complex stratum V systems and shape the social, political and economic contexts in which they operate. Construct the future rather than forecast it.
V	Shaping: make relationships between previously unrelated material; create general rules and redefine fields of knowledge and experience. Engage with an open context and decide when it should be closed; operate a complex five stratum system, modify its boundaries and cope with second and third order consequences which arise. Elements explicitly seen as inter-dependent; to change one part is to change the whole.
IV	Transforming: retain contact with what currently exists and detach to conceptualise something completely different - not a modification but a point of departure. Contrast and compare alternative operating systems and alternative modes of deploying or modifying them. Maintain a patterned structure within which hypotheses are tested.
III	Extrapolating: extrapolate from given rules and handle ambiguity by creating new connections within a defined system. Mould operating tasks and operating methods into a system of direct work and fine tune that system to cope with changing trends.
II	Defining: generate different perceptions of a given situation; organise perceptions in alternative ways; handle ambiguity by polarising. Put together a programme of direct operating tasks in order to accumulate knowledge about their aggregation and to change programmes in the light of the given situation.
I	Shaping: see the world through a few focussed dimensions and engage directly with physical objects or serve people one task at a time.

In summary, Career Path Appreciation is a procedure which allows (a) interpretation of the present relationship between the respondent's current capacity to exercise discretion and the work for which s/he is responsible (b) consideration of the history of that relationship (c) consideration of the likely future of that relationship; and, for the respondent (d) awareness of the internal resources s/he has been drawing on to do work.

An Appreciation is concerned with the working life as the relationship between the person and the organisation(s) in which s/he is employed. Lofland and Lofland's (1982) description of the intensive interview as "a guided conversation which seeks to elicit materials of substantial depth for use in qualitative analysis" is a useful way of thinking about an Appreciation.

b. The Criterion

In each case the criterion used was the level of work at which the subject was employed at the time of follow-up. This criterion requires some comment: The first point is that it is related not to training or to predicted rate of promotion, but to actual performance for which the employing organization was prepared to pay a salary.

Secondly, ideal conditions would have allowed measurement of level of work by means of the time-span of discretion. Unfortunately, ideal conditions did not prevail, and such accurate measurement was not possible. But, in the oil and the fertilizer companies, it was possible to use time-span and accurate descriptions of levels of work to match the system for describing levels of work in use in those companies (Hay MSL) with the model as defined by SST. In the engineering company and the mine, work was structured in terms of the model.

The levels of work as measureable in time-span and as described in SST are illustrated in Table 2.

Section 4: The Four Settings in which Data were Collected

As indicated above, the studies were undertaken in four very different settings. Each company is described in detail in order to emphasize the very considerable differences in the settings. The differences are in scale of the organization, type of activity, economic and social climate in which it is operating, and the ethnic backgrounds of employees. Each of the four companies conducted its own study of the predictive power of Career Path Appreciation, and these are described in the section on the company.

a. The MultiNational Oil Company (84 respondents followed up)

The original work was done in 1974 at the request of the personnel department which felt that there was considerable common ground between the approach made possible by SST and their own procedures for identifying potential.

In the ten years that elapsed since the original evaluations of current level of capability of the respondents and the follow-up in terms of the level of work at which they were employed, this company had to adopt a more entrepreneural style and to manage the consequences of nationalization of a number of operating companies in developing countries.

1. The Study Undertaken by the Oil Company

The original study in 1974 included 100 respondents, and it was agreed that there would be no follow-up of specific individuals. In 1984 the company decided that it would undertake a follow-up study. It was able to trace 84 people still in its employ. Eighty-two of these were men and two women. All were of Anglo-Saxon origin. Since the study was done purely for research purposes, access to the original judgments was restricted to one person and to his successor in the personnel office.

This part of the sample represents the earliest stage of the development of the predictor -- that is to say, the extended interview, including only the symbol card task and a brief career history used to elicit the material on which the evaluation of current level of capability was made.

When the company did the follow-up study, they did not appreciate that the evaluations made were explicitly of current level of capability, but that they carried an implicit prediction of potential. Accordingly, their correlation on the full sample was between the explicit predictor, that is to say, the evaluation of the current level of capability at the initial interview and the level of work achieved nine years later. Four outliers were removed because both the personnel director and senior managers judged these people to be out of the ordinary. The correlation between predicted and achieved scores was .71. The company commented that the predictive validity of psychological testing is usually reported as much lower than this, below say .45 (see Table 1).

A correlation was also done specifically on those members of the sample who were under 35 at the time of the Appreciation. For that group the correlation between predicted and achieved level was .84.

In completing the study reported here, results of the original evaluations made for each respondent (including the four outliers) were extrapolated along the appropriate curve for nine years, and that position then correlated with the level of work at which s/he was employed in 1984. These data are presented in Table 4. The correlation between predicted and achieved level was .70.

In view of the fact that there can be no follow-up of specific individuals, it is possible to note only that there appears to be a tendency for people of more limited potential (in terms of the predictor) to be employed at higher levels than would be expected. Informal comment from the company suggests that a possible explanation could be a recognized tendency to overvalue operational skills.

b. The Multinational Engineering Company (35 respondents followed up)

In the course of the period of the follow-up study, this company has had to face a decline in heavy engineering in the United Kingdom, but it was subsequntly involved in extensive developments outside Europe, building an international reputation in high-tech engineering. Then in 1986 it was taken over by a rival.

Among the respondents followed up in this company, 5 were originally interviewed between 1974 and 1979 before the refinement of the procedure and 30 between 1979 and 1983. The respondents included actual graduates and those selected for an MBA course. Thirty are men of Anglo-Saxon origin and one is a woman.

The work had the dual purpose of research and application. The evaluations of current level of capability and the prediction of rate of growth were available only to the personnel director; they were not disclosed to the respondents or to their line managers. After 1979 the evaluations were made by two administrators working independently.

Since there were only 35 respondents in this company, they were included in Table 5 which displays all respondents. Those interviewed in or after 1979 are in Table 6.

1. The Study Undertaken by the Engineering Company

In 1987 the personnel director decided to undertake his own follow-up study on 30 people interviewed between 1976 and 1984 on whom there was sufficient information for him to judge that they could be used as a sample to test the predictive power of the procedure. Because he included an additional year in his study and because he chose to follow-up only those on whom he could gather more detailed information, 24 of his subjects are the same as those of the authors, and 6 are graduates originally interviewed in 1984.

This group is all male. Twenty-six of the 30 (86.7%) are working capably at the level predicted; two are over-performing by one level (one of these has just been declared redundant) and two are under-performing.

The underperformers are described in the following cases:

Case 1: A 39-year-old metallurgist and licensed engineer. Undoubtedly intelligent but rather a negative character; seems to exhibit a lack of drive; obtained specialist MSC and generalist MBA degrees; operating in specialist metallurgical field.

Case 2: A 36-year-old computer specialist. Has started two degree courses but finished neither although has the intelligence to do so.

c. The Fertilizer Company (38 respondents followed up)

In the period covered by the study this company has faced very considerable difficulties, and a substantial number of its employees have left or have been declared redundant. The company operates in a declining field and is subject to powerful environmental lobbies. Despite these difficulties, the company was bought in 1982 by a Norwegian company who invested heavily in a new plant located in the Northeast of the United Kingdom.

The earliest work in this company was done in 1976 and the bulk in 1977 as the procedure was being refined by the addition of the phrase cards and a more structured work history interview. All the respondents were male and of Anglo-Saxon origin.

The evaluations were all made by the author as part of an extensive procedure. They were not fed back to the respondents or to their managers nor (because of the circumstance described above) were they used for career planning or individual development.

The follow-up study included interviews with 38 (61.3%) of the original respondents. In each case the criterion used was the level of work at which they were employed in 1987 or the level at which they were employed when they left the company if that was more than four years after the original interview. Because there are only 38 respondents in this company they are included in Table 5.

1. The Study Undertaken by the Fertilizer Company

In 1981 two members of the company personnel department decided to make a study of the methods of identifying potential used by the company between 1976 and 1981. Since they were looking for an immediate answer on predictive value, they could neither lock away the data nor wait for time to elapse. An alternative method was used. A small team from the personnel department considered each person for whom the data existed and subjectively assessed the highest level in the organization that they were likely to reach if there were no constraints on promotion, and

ability alone was the criterion. Each person was considered, and the sum of the information available from the sources listed below was weighted and assessed:

(1) level already achieved; (2) tests (the AH5 group test of high grade intelligence, the Watson Glaser Critical Thinking Appraisal, the Kostick Perception and Preference Inventory, the Fineman Self-Description Inventory Work Preference and Job Climate questionnaires, an Assessment Centre rating; (3) career development interviews; (4) job performance (judged by the immediate manager and more senior managers).

Individuals were then assigned to the highest level of work at which it was considered they had the potential to perform competently. That level was called "Considered Potential".

Considered Potential assessments were made on 223 people. All the available data were correlated with Considered Potential and the correlation between the company's rating of Considered Potential and the level of work (predicted by the extended interview which preceded the fully developed Career Path Appreciation) was .73.

The company concluded that the evaluation of potential capability (which they saw as independent of organisation culture) was a most powerful and reliable method for informing decisions involving assessment of managerial potential.

d. The Mine in a Developing Country (25 respondents followed up)

This company in Africa describes itself as "A First World company using First World technology, competing in First World markets with a First World product, but located in a Third World country."

The management of the mine is committed to the development of indigenous staff, and the original invitation to work with them was specifically on this group. The work started in 1982, and the follow-up reported here was done in 1986.

Of the 25 respondents, (15 men and 2 women, or 68%) are members of the indigenous population which is tribal, predominantly pastoral and of limited education (only 6 respondents (24%) have been educated beyond primary school level. The other 8 (32%) respondents are men of Anglo-Saxon origin.

The evaluations of the current level of capability of the 17 members of the indigenous population have been used to plan training and individual development. Evaluations on the other 8 have not been so used. Because follow-up data is available for only small numbers at the moment, all 25 are included in Table 6. When further and more detailed information is obtained, the data derived from cases where the judgments have been used will be presented separately.

Preliminary analysis of follow-up studies of 92 more employees at the mine is presented in Section 5. More detailed analysis of the data will be completed by the Spring of 1988.

1. The Study Undertaken by the Mining Company

In 1985 the personnel manager of the mine was asked to present a paper on the prediction of potential at an international company conference. In the paper he spoke of the need for the management of the company in the future to come from the indigenous people and of the difficulty of developing people in a country with a poor education system which does not provide a foundation of recognized and reliable criteria of individual assessment.

He outlined the way in which Career Path Appreciation had been used for individual development and departmental restructuring, and concluded that "the major benefit of using Career Path Appreciation is that it works. It does actually give you an accurate prediction of a person's performance potential for the future. We estimate a probability of success of .8, climbing all the time. The second benefit is that it is understood and confirmed by the individuals being assessed. The third benefit is that it is more cost effective."

Section 5. Results and Interpretation

a. The Sample

The full sample now consists of 274 people. But, in this section, the predicted and achieved levels of only 182 people are displayed in scattergrams and fully analyzed. The details of the data on the other 92 members of the sample have not yet been fully analyzed; but some trends are evident in a cursory examination of the data.

Within the sample, educational qualifications range from doctorates to primary school certificates; the age range is from 21 to 55. Respondents were currently employed at Levels I, II, III, IV, and V; 5.4% are women; and 21% black or brown Africans. Finally, the settings in which the respondents were employed are significantly different from each other (see Section 4).

Members of the sample were followed up over periods ranging from 4 to 13 years. The cut-off point of four years was chosen because, that seemed the minimum necessary to indicate and established trend.

b. The Data

1. The Group of 182 People:

In presenting the data on this group, it was decided that a correlation of the relationship between predictor and criterion on all 182 would be made because that would include the longest period of follow-up. But it was also decided to do a correlation between predictor and criterion on the 76 respondents where the predictor was the refined procedure of Career Path Appreciation.

The data are presented in scattergrams where the actual level of work at which the respondent was employed at the time of follow-up is plotted on the vertical axis and the level predicted by the extended interview (from 1979, the Appreciation) on the horizontal axis. In order to add to the interpretation of the scattergrams, a matrix of levels of work has been superimposed.

Five levels of work -- each divided into high, mid and low -- are plotted on the vertical axis. Each level of work is assumed to require in the individual a current level of capability (scope of exercise of discretion) which can generate and respond to the complexity of that level. Each corresponds to a commonly used category of management.

Level I is nonmanagerial work with a time-span of up to three months. None of the long-term follow-up sample remained in this level. Level II is first-line management/first level specialist work with a time-span of three months up to one year. Level III is middle management/principal specialist work with a time-span of one year up to two years. Level IV is senior management/strategic staff work with a time-span of two to five years. Level V is senior executive management of strategic business units with a time-span of five years up to ten years, and Level

VI is multinational corporate work with a time-span of ten years up to twenty-five years (there are only two bands marked within this level).

The horizontal axis represents the level of work which the respondent would be expected to be able to handle in the light of the original evaluation of current level of capability and the slope of the growth curves; each level is similarly divided into high, mid, and low.

Table 4 displays data on 84 respondents from the multinational oil company who were followed up after 9 years. The correlation is .70. It will be recalled that this table includes four outliers excluded in the company's own follow-up study, and that it is an extrapolation over 9 years.

Table 5 displays data on 182 respondents who were followed up over periods ranging from 4 to 13 years. It will be clear from Section 4 that the group includes men and women from different cultural backgrounds. Some are educated to the Ph.D level, and there are some who left school at age 11. With regard to the correlation of .79 obtained from this data, it is important to note that the data include evaluations of current and future level of capability made in the earliest stages of the research and development of Career Path Appreciation.

Table 6 displays data on 76 respondents who were followed up over periods ranging from 4 to 8 years; that is to say, respondents for whom evaluations of current and future level of capability were made by using the refined procedure. The correlation of .89 is assumed to indicate the effect of that refinement.

Table 7 displays data on 59 of the respondents included in Table 6. The 59 are those who remained in the employment of their organization. It will be noted that the correlation here is .92. Examination of Tables 6 and 7 shows that, of the 17 who left, 13 were, in terms of predicted rate of growth, under- or over-used.

2. The Group of 92 People

The data on the other 92 members of the total sample have not yet been put into tabular form. These people are all employees of the mining company in a developing country. The material is of particular interest because of the heterogeneity of the sample in terms of race and education.

Thirty-four people are of Anglo-Saxon origin (36.9%); 58 are black or brown Africans (63%). Eighty are men and 12 are women. Of the 58, 17.2% are university graduates, 15.5% had completed secondary school, 15.5% had completed three years or less of secondary school, and 51.7% had no education beyond primary school.

In each case the procedure for predicting potential was a Career Path Appreciation. The evaluation of current level of capability was used to plan individually-tailored training programs and opportunities and to predict a comfort curve. An individual's comfort curve represents (or

Table 4

Follow-up on 84 respondents (Multinational oil company)

Predicted Level		Actual Level at Follow-up: II L	II M	II H	III L	III M	III H	IV L	IV M	IV H	V L	V M	V H	VI L	VI M
VI	M							*					2	2	
	L									*					*
V	H										*				
	M						3	*		*	2	2		*	
	L											*	*	*	
IV	H					*	*		4	3				*	
	M				*			*			*				
	L				2	3		2	2	6	2				
III	H				2		2	2		*					
	M			2	*	4		*		2					
	L														
II	H		*	*	3	*	2	2							
	M				*	*									
	L				4										

Correlation (R) = 0.70628
Std Err of Est = 2.43071
Significance: $p < 0.00000$

Table 5

Follow-up on 182 respondents (4 - 13 year follow-up)[a]

Predicted Level		II			III			IV			V			VI	
		L	M	H	L	M	H	L	M	H	L	M	H	L	M
VI	M							*					2	2	
	L									*					*
V	H										*	*	*		
	M						3	*		*	2	2	*	*	
	L											2	*	*	
IV	H					*	*		4	7	*	*		*	
	M				*			*	4	2	*				
	L				2	3		5	3	7	2				
III	H				3	3	9	11	2	2					
	M			2	6	12	7	3	*	2					
	L			*	10	*	2								
II	H		*	7	5	*	2	4							
	M		2	2	*	*									
	L	*	*		4	*									

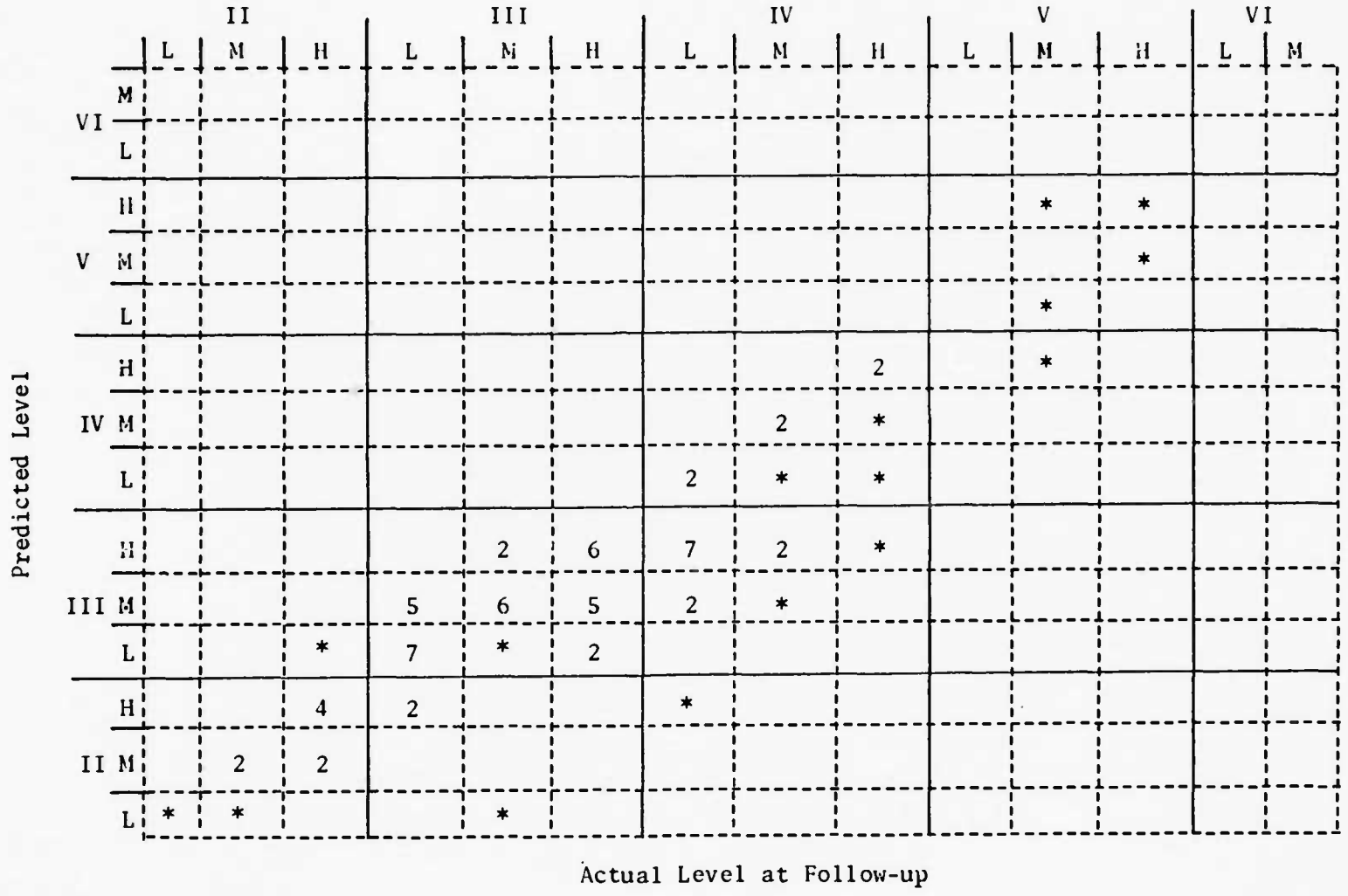
Actual Level at Follow-up

Correlation (R) = 0.79226
Std Err of Est = 1.81508
Significance: $p < 0.00000$

[a]Total sample of 244 less 92 employees of a mining company in a developing country.

Table 6

Follow-up on 76 respondents (4 - 8 year follow-up)



Correlation (R) = 0.89224
Std Err of Est = 1.02868
Significance: p < 0.00000

Table 7

Follow-up on 59 respondents[a]

Predicted Level	Actual Level at Follow-up: II L	II M	II H	III L	III M	III H	IV L	IV M	IV H	V L	V M	V H	VI L	VI M
VI M														
VI L														
V H											*	*		
V M												*		
V L											*			
IV H									2		*			
IV M								2						
IV L							2	*						
III H						6	4							
III M				2	6	5	*							
III L				7	*	*								
II H			4	2			*							
II M		2	2											
	*	*			*									

Correlation (R) = 0.92996
Std Err of Est = 0.93108
Significance: p 0.00000

[a] Table 6 respondents who remained employed by their organizations.

less optimistic. This shift was apparent by the fifth year and changed little over the next 15.

Bray and Howard (1983) concluded that, "to a great extent, measureable differences in managerial abilities and motivations that would foretell success were present when the men first came to the original assessment centre." Most of the 26 assessment dimensions had significant correlations with success after 8 years. Indeed most of these relationships held even after 20 years (page 301).

The correlations are displayed in Table 8.

Table 8

Some Assessment Exercises Predicting Management Potential over 20 years

Exercise	r
SCAT[a] - Total	.40**
Range of Interests	.30**
Organizing & Planning (In-Basket)	.19*
Inner Work Standards (In-Basket)	.24**
Need Dominance Scale (EPPS)[b]	.18*
Ascendance Scale (GAMIN)[c]	.20*
Expectations Inventory	.18*
Need for Advancement (Interview)	.44**

Note r's = 199 - 266
* $p < .055$
** $p < .001$
a. School and College Aptitude Test
b. Edwards Personal Preference Schedule
c. Guilford-Martin Inventory of Factors

(b) The Anstey Study:

This is a 30-year follow-up of the Civil Service Selection Board procedure in the U.K. (Anstey 1977). Three thousand one hundred candidates for the Civil Service were assessed between 1945 and 1948; 421 between the ages of 21 and 30 were appointed. The follow-up sample was the 301 people still in the service in 1975.

The predictor was the mark (or grade) at the final selection board. This mark represents a summation of scores from tests and interviews concerned with intellectual, communication and interpersonal skills. The criterion was the rank achieved after 30 years. Most equalled or surpassed the predicted ultimate level of work, but some of this could be accounted for by an increase in the number of senior posts during the 30-year period.

The correlation between the final selection board mark and the rank attained was r = .354. That was then corrected for selectivity to r =

constitutes) a rate of growth in responsibility in work which is in line with the predicted rate of growth of his or her capability.

Within this group, there was one evaluation of current level of capability which was an underestimate. Apart from this case, the others have acted in line with the prediction of rate of growth of capability made in the Appreciation: Twenty-one percent have left the company. In 80% of those cases their leaving could have been predicted because it was clear from the Appreciation that they were underused. In four individual cases, a manager made the decision to promote a subordinate who (in terms of predicted rate of growth) was not yet ready for the extended responsibility. Three of these were demoted within six months and the fourth is showing signs of considerable stress.

The overall indication from preliminary analysis of this material is that (over a four-year period) the predicted rate of growth of capability has been borne out in 94% of the cases.

c. Comparison with other Long-term Studies

1. Summary of the studies

Two major longitudinal studies which set this research in context are those of Bray (1983) and Anstey (1977).

(a) The Bray Study:

In 1956 the Bell Telephone Company decided to initiate longitudinal research into managerial lives. Four hundred and twenty-two new managers took part in a three and a half day assessment centre. Assessment included a battery of projective tests, psychological inventories, attitude surveys, interviews and simulations. The initial assessment of the group took five years and included two distinct populations of white males: recent college graduates hired as management trainees (N = 274) and non-college employees who had worked their way up in the company (N = 148).

In this study the predictors were 26 assessment dimensions derived from the total test battery. The criterion was the level of work defined as Level III, or district (in broad terms, middle management) or higher.

Each person was followed up by interview every year. After 8 years they were again put through an assessment centre; and, in the twentieth year, through a different assessment procedure. Both intelligence and knowledge test scores increased over the period, but there was a marked drop in score for interpersonal skills. In terms of some simulations, management skills were not improved in the eight-year period; and, indeed, some were lost.

The material reported from the follow-up after 20 years shows that as participants got older, their expectations became more realistic and

.66. Anstey suggests that this correlation may be an underestimate because of the nature of the sample in which all the individuals were very well educated. Anstey also points out that it is considerably higher than other correlations of tests of abilities with demonstrated competence at work.

2. Comparison of the Three Studies

(a) The samples: The Bray sample is the largest, with 422 members compared with 301 in the Anstey study, and 274 in this study. The composition of both the Bray and Anstey samples is less diverse than the sample of this study. Members of the first two samples are Anglo-Saxon and male. The sample of this study includes a small number of women and a fifth are African. The Bray sample includes graduates and nongraduates. Members of the Anstey sample were all described as "well educated". The educational qualifications of members of our sample range from very extensive high to very limited. The Bray and Anstey studies were both done in a single organization. Members of our sample were employed in four very different settings.

(b) The procedures for predicting potential: The Bray study used 26 different assessment dimensions which take some days and experienced observers to determine; the Anstey study used a range of assessment dimensions based on five days of tests, observations and interviews which were summarised in a single final mark. The tests, observations, and interviews all required skilled staff. A Career Path Appreciation focusses on the current capacity to generate complexity, takes only two hours to administer, but does require a highly trained administrator.

(c) The criteria: The criterion in the Bray study was a particular level of work or higher; in the Anstey study the criterion was level of work achieved. The establishment of that level was based on careful analysis and modelling of the work of senior staff. Our criterion was level of work achieved with the level evaluated by analysis of its complexity.

(d) Time scale of follow-up: The Anstey study extended over 30-year period; the Bray study over 20. Our longest period to date is 13 years. Some of the people have been followed up after only four years. In view of the fact that this study set out to test an already well-formulated and tested hypothesis about growth in capability, the shorter time scale can be justified. Where possible, further follow-up studies will be undertaken; but, in the present socioeconomic climate, it is becoming increasingly difficult to maintain contact with people who are less and less likely to remain in the employ of a single company over long periods of time.

d. Interpretation of the Data

In a recent article Guion (1987) raised important questions about the bivariate correlation between predictor and criterion -- the validity coefficient -- in selection research. Since selection research carries

with it an explicit or implicit concept of potential for growth, Guion's analysis is used here as a basis for looking at the validity of the whole process described above.

Guion pointed out that views of validity are changing and that the current trend is to expect to be able to rely on more than a single correlation coefficient. In order to consider these points in detail in regard to the data presented in this study, I will follow his categorization of the four components of the established practice: i) choice of predictors; ii) choice of a criterion; iii) data collection, and iv) evaluation of the predictors.

1. Choice of Procedures for Prediction

Guion (1987), suggests that the current trend is towards predictive procedures which are directly related to "work orientation", that is to say, a tendency to look to traits manifested explicitly at work rather than to those shown in a broader array of situations.

The procedure used in this study -- an evaluation of the respondents' current level of capability -- has been evolved from a definition of work which includes the psychological experience of doing work and the scale of the organizational setting in which it is being or is to be done. As stated above, a Career Path Appreciation is a procedure for considering and giving meaning to the relationship between individuals and the organizations that employ them.

Within the Appreciation, the phrase cards give an indication of the extent of the current and future possible contexts in which the person can generate and respond to complexity. The symbol card task assesses the person's capacity to order chaos. Both indicate the relationship between the "cognitive map" available to each individual as a guide and the actual territory of the environment in which the person operates.

Both Ashby's (1956) Law of Requisite Variety and Korzybski's (1933) reminder that "the map is not the territory" are relevant here. They can be drawn together into the concept of the workscape of the individual -- that scope of responsibility for work and resources which the individual can map.

The concept workscape emphasizes the link between an important postulate of SST theory and of the Appreciation. The postulate is that levels of work are differentiated by the dimension of complexity; the core of an Appreciation is an evaluation of the person's capacity to generate and to respond to complexity.

Further, a Career Path Appreciation is, explicitly, a procedure in which work-sampling is one of the prime components. A third point which is concerned specifically with the psychological experience of doing work will be discussed.

A further point about the predictor used in this study relates to its concurrent validity. As Guion (1961) points out, concurrent validity is no substitute for predictive validity, but it does give a useful indica-

tion of the relationship between the predictor and actual behaviour at work. Data on the concurrent validity of Career Path Appreciation have become available in four settings where an organization wished to use the procedure. But, before doing so, they wanted some indication of the degree of felt congruence between the evaluations made and the formal or informal managerial judgments of the respondents' current performance and likely rate of growth.

(a) In the multinational oil company two such correlations were made in the course of the original study. Both were formal because the company had in place a system for identifying potential. The first (of .71) was between the evaluation of current level of capability as made in the extended interview and the level of performance as stated on the company assessment forms. The second (of .86) was between the evaluation of current level of capability and the actual, verbal statement of the manager about performance. The discrepancy between these correlations raised questions about the company system of assessment which it was not possible to pursue.

(b) In a multinational chemical company where work started in 1985 a less formal study was done, but with the purpose of considering the match between evaluation and managerial judgment. In this case 37 respondents were involved, and the correlation was .79.

(c) As stated in Section 4, the fertilizer company undertook its own study of the correlation between "considered potential" and the evaluation of current level of capability. They found a correlation of .73.

(d) The British Army Staff College (where Career Path Appreciations have been offered for purely research purposes for the last eight years) has done informal correlations in five of those years; they range between .71 and .77.

An interesting point to be made about these indications of concurrent validity is the initial attitude of the organization that the correlation indicates the efficacy of their system, however formal or informal. On further reflection the conclusion is that, although it may be efficacious, it is not efficient simply because in-house judgments are not held to be reliable unless they have been built up over a period of time. Evaluation of current level of capability can be made in a Career Path Appreciation (which lasts for two hours).

2. Data Collection

Guion (op. cit.) suggests that the biggest change of view about data collection is in desired sample size. Researchers are now looking for much larger samples than the 30 or so subjects that were previously acceptable. The sample size of this study at present is 274. In view of the considerable difficulty of maintaining contact with respondents in the present social and economic circumstances where change of employment is the norm, a sample size of approximately 300 seems a fair number from which to draw conclusions. The detailed data presented here

refer to 182 people with preliminary analysis of a further 92 cases. These numbers are probably sufficient to indicate consistent trends.

3. Choice of a Criterion

Guion points out that 30 years ago a single, overall criterion was regarded as "indispensable" for selection research (Nagle, 1953). By the 1960s the use of multiple criteria was being urged (Dunnette, 1963, Guion, 1961). But, by the late 1970s, results of validity generalization studies questioned whether fine distinctions among criteria were worth making; and the trend (once again) favoured an overall, global measure.

The criterion used in this study is defined by the theory which provides a well-tested model of the way in which work is organized in levels of increasing complexity. But there is a problem with this criterion. On the one hand, it is clearly job related in that the level of work at which the respondent is employed at the point of follow-up is the actual, social reality of what the organization is prepared to pay for current perceived levels of capability. On the other, one of the difficulties of follow-up of this kind is that it was not possible to use the time-span of discretion -- the instrument for measuring levels of work which is made available by the theory. However, the level of work can be categorized by examining the work itself and directly analyzing the level of complexity.

The settings in which the work was done were such that it was possible to accommodate the ways in which work was structured within the organization with the structure of complexity provided by the model. But in pure terms it was not possible to use a fully construct-related criterion.

4. Construct Validity

a. The array of growth curves:

SST makes it possible not only to place predictor and criterion in the same content domain, but also (by means of the array of growth curves) to predict the relationship between the two for a given individual at a given time.

As we pointed out on page 4, a common assumption in all assessment is that adults develop and that they develop at different rates. This assumption may be formalized in a minimum development curve which assumes a certain rate of growth. The array of growth curves in the model makes it possible to go beyond the idea of a minimum development curve to offer a specific prediction about the likely rate of growth of the capability of a particular individual.

This study is both an application and a test of the slope of the array of growth curves derived by Jaques from data on individual earning progression and offered as a hypothesis about the growth of the capacity to exercise discretion which, at any given time, will be manifested in the person's current level of capability.

Details of other tests of the slope of the curves are available in the more extensive Technical Report on the Prediction of Potential. A more general point may be made here about curves of this general type. In biology there has always been considerable interest in the growth processes of living systems. In one study quoted by Saunders (1967), a comparison was made between three growth curves plotted by measurements over a period of time: That of an individual plant (a sunflower seedling), that of a multicellular organism (a colony of bacteria), and that of a population of organisms (fruit flies in a bottle). In each case the same form of logistic curve was found to fit all three curves.

This form of logistic curve has also been used to predict the growth patterns of populations, industries and industrial products. A number of studies of predictive validity have been done (e.g. Lasky, 1951; Pearl, 1922). One study showed that the final height of a sunflower seedling could be predicted to +/- 5%, if the data for more than 50% of the life cycle were used. A similar study fitted the logistic curve to the growth of railway track in Britain in the nineteenth century. The data to 1870 (which were past the peak) gave a ceiling prediction of 20,000 miles in 1920 whereas the actual ceiling was 23,700.

Saunders found that the logistic curve could readily be fitted to Jaques' array of growth curves; and hypothesised that they too would have a very high degree of predictive validity. However, in the absence of a procedure which could place a person on a particular curve, he was unable to test his hypothesis. Of special interest are the studies indicating that the final point of the matured curve can be predicted with +/- 5% accuracy if the data for more than 50% of the life cycle is available. If we apply this to the capability growth curves (see Figure 1), it would suggest that it would be progressively more difficult to predict the final point of the growth curves in those people whose capability will not mature until mid-life or beyond (those whose comfort curves fall within modes VI, VII and VIII). This could explain the widely accepted difficulty for managers in recognizing and acknowledging the potential of these people in their 20s, with the consequence that they are not given appropriate opportunities. This difficulty may be contrasted with the intuitive recognition of the potential of people whose comfort curves fall within modes IV and V -- the assumption being that the curve is a straight line and the risk that they may be overpromoted.

The correlations obtained from the data presented offer further evidence for the predictive validity of the array of curves as the representation of an intrinsic pattern of growth in the capability to generate and to respond to complexity.

b. The Capacity to Generate and to Respond to Complexity

The correlations reported can be partly accounted for in terms of the coherence of the underlying theory and the predictive validity of the array of growth curves. The coherence of the theory rests on a definition of work that allows a common approach to the levels of complexity in which work is organized, the individual capacity to generate and to respond to those levels of complexity, and the growth of that capacity within and across levels. It is this coherence that has made it possible to develop a more accurate procedure for predicting potential.

Almost 20 years ago, Jaques (1970) suggested that the capacity to generate and to respond to complexity was dependent on a constant interplay between verbalized and nonverbalized material. He pointed out that although "the exercise of discretion" is a profoundly familiar sphere of psychological activity, it is conceptually ill-defined. As a consequence, there is no satisfactory language for it.

People simply cannot put into words all that they are taking into account in making the decisions that will forward their work. In that sense, they cannot be sure that what they have decided to do will get them where they want to go, will achieve the result they want to achieve. They judge, think, hope -- and, indeed, pray -- that it will, but they cannot be sure. Only time will tell. In an attempt to convey the experience of the interplay between verbalized and nonverbalized material and its significance for them, people tend to use words like "judgment, intuition, nous, skill, experience, know-how, common sense, gut-feel, hunch, discretion, discrimination".

Over the last 20 years there has been a steady growth of interest and research into the processes of decision-making. One of the significant outcomes has been the distinction between "rational, logical, analytic" styles which are readily expressed in words or numbers and "non rational, intuitive" styles which find readier expression in symbols and images (see, e.g., Mintzberg, 1976). Some of this research has been underpinned by neurophysiological evidence (see, e.g., Levy-Agresti and Sperry, 1968 and Gordon, 1986) and some by work in artificial intelligence and expert systems (see, e.g., Barr and Frigenbaum, 1982 and Simon, 1979).

Another strand in this tapestry can be seen in what may be thought of as "techniques" for enhancing creativity in decision-making. Many draw explicitly on the use of symbols, metaphors and images in order to draw on material which has not been verbalized (see, e.g., Gordon, 1961, de Bono, 1971; and Prince, 1982; and, for a review, Rickards, 1987).

In a recent article about the role of intuition and emotion in decision-making, Simon (1987) argues that it is fallacious to contrast "analytical" and "intuitive" styles and that the effective manager "does not have the luxury" of choosing between the two. He refers to Barnard's (1938) distinction between "logical" and "non logical" processes for making decisions and quotes his comment that "By 'logical' processes I mean conscious thinking which could be expressed in words or

by other symbols, that is, reasoning. By 'non logical processes' I mean those not capable of being expressed in words or as reasoning, which are made known by a judgment, decision, or action".

In considering contemporary views of these "two different forms of thought", Simon (op. cit.) is critical of what he calls "the more romantic versions" of the split-brain research. But he goes on to argue that there is now a substantial amount of evidence for the two different forms as essential components of the complete domain of decision making (see, e.g., Simon, 1979; Doktor, 1978; Gordon, Charns and Sherman, 1987; Rickards, 1987; and Taggart and Robey, 1981). In particular, Simon emphasises his observation that people reach decisions without being able to report the thought processes that took them to their conclusion.

A considerable and growing trend in current thinking about decision-making, including, e.g., Sternberg's (1985) work on "tacit knowledge", which emphasizes "insight", "gut-feel", "intuition" and the significance of access to nonverbalized material. Career Path Appreciation -- which is now a widely applied and well-researched procedure -- can contribute to this approach to decision-making in three ways:

1. It can extend understanding of these processes in general terms.

2. It can make it possible for the respondent to make spontaneous discoveries about the internal, nonverbalized resources s/he has been using in decision-making about work. This can, then, increase his/her skill in gaining access to them. In addition, the administrator can offer explication of the way in which the respondent seems to be drawing on internal resources, thus heightening awareness of the resources, affirming use of them, and further enhancing access.

3. Because it is a predictive procedure, an Appreciation can offer an opportunity for a better understanding of the current and likely future range of one's decision-making capability. Further, the underlying theory can contribute to an extended understanding of the relationships between levels of complexity of work and range of complexity of decision-making in the life of organizations and of individuals.

The final point is that the construct validity of Career Path Appreciation rests in a coherent theory of work. The theory offers a definition of work, a hypothesis about increasing complexity in the way work is organized in response to extending environments and, a hypothesis about individual differences in growth in the capability to do work of increasing complexity.

The research described in this report -- in particular, the accuracy of the predictions of rate of growth of potential -- provides further confirmation for these hypotheses:

(1) The hypothesis that there is discontinuity between levels of complexity in work and in individuals. The evaluation of current level of capability is made on the premise that there are qualitative differences between levels and that they can be observed by a well-trained administrator.

(2) The hypothesis that adults do develop, that they do so at broadly predictable rates, and that there are differences between individuals. The confirming evidence for this comes from the follow-up data which demonstrates that, in a heterogeneous sample of people in four organizations operating in diverse environments and various parts of the world, differences in rate of adult development at work are recognized by promotion and pay, and can be predicted by an Appreciation.

In the first section of this report I suggested that a coherent theory was required to enhance the content and the predictive validity of procedures for predicting potential. I conclude by suggesting that the correlations obtained in these follow-up studies confirm the power of the theory used as the basis for Career Path Appreciation. The definition of work as "the exercise of discretion within prescribed limits" made it possible to develop a procedure based on work-sampling. The hypothesis about discontinuity in states of complexity brought predictor and criterion into the same content domain and made it possible to evaluate current capability. The array of growth curves provided an explicit hypothesis about rate of individual growth.

Career Path Appreciation can be seen as an application, a confirmation; and, in some ways, an extension of Stratified Systems Theory.

Gillian Stamp
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